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RESEARCH PAPER

Reliability and validity of perceived self-efficacy in wheeled mobility scale among elite wheelchair-dependent athletes with a spinal cord injury

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***Purpose*: To study the reliability and validity of the perceived self-efficacy in wheeled mobility scale among elite athletes with a spinal cord injury (SCI). *Method*: During the Beijing Paralympics, 79 participants with SCI completed the SCI Exercise Self-Efficacy Scale (ESES), the revised Self-Efficacy in Wheeled Mobility scale (SEWM) and the perceived wheeled mobility (WM) at present Visual Analog Scale (VAS). Sample included athletes from 18 countries and subcategorized by gender, lesion level/completeness and type of sports. Reliability and concurrent validity were determined. *Results*: SEWM Cronbach's α was 0.905. High internal consistency was confirmed in Split-half correlation coefficient (r = 0.87). Validity was supported by significant correlations between SWEM and ESES total scores (r = 0.64, p < 0.05), and between SEWM and WM VAS scores (r = 0.60; p < 0.001). Subgroups analyses showed that athletes with tetraplegia showed significantly lower WM self-efficacy levels than those with paraplegia. There was a significant difference in perceived WM self-efficacy between athletes who participated in dynamic wheelchair sports and those who participated in non-wheelchair sports (p < 0.03). *Conclusions*: The SEWM is a reliable and valid scale among Paralympic athletes with SCI. Findings confirmed a significantly higher perception of self-efficacy in WM among athletes who participated in dynamic wheelchair sports.**

Keywords: Spinal cord injury, Self-Efficacy in Wheeled Mobility scale (SEWM), Wheelchair sports, Validity

Implications for Rehabilitation

- Increased self-efficacy in wheeled mobility (WM) may encourage wheelchair users with spinal cord injury (SCI) to approach, persist, and persevere at WM related tasks that were previously avoided.
- The perceived self-efficacy in WM scale (SEWM), which is available on-line in five different languages, may find clinical applications for people with SCI in different countries.
- The SEWM can be applied to the assessment of progress in WM levels during the acute rehabilitation phase, and also in structured WM workshops conducted after discharge from the hospital.

Introduction

On a daily basis, manual wheelchair users with a spinal cord injury (SCI) encounter many wheelchair-related barriers and obstacles, which can limit their participation in both leisure and professional activities. According to the International Classification of Functioning Disability and Health (ICF), the concept of wheeled mobility (WM) is a subcategory of the category "Moving around using equipment" [1]. For individuals with SCI, it refers to their ability to move around, using a wheelchair, in different and quite challenging environments. Given that approximately 80% of the persons with SCI will remain dependent on a wheelchair for the rest of their lives [2], acquiring wheelchair skills has to be considered as an important part of SCI rehabilitation. The link between wheelchair skills performance and participation was demonstrated in a cross-sectional study by Kilkens et al. [3]. The level of wheeled mobility is thus indicative of the involvement in daily activities, which is a crucial factor for the quality of life. Therefore, increasing wheeled mobility and

The latest version of the SEWM scale in different languages, can be freely obtained at: www.scionn.nl/inhoudp28.htm

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skill performance will have a great impact on the functional independence of SCI patients, and mastering wheelchair skills can make the difference between dependence and independence in daily life for people with SCI [4].

Functional outcomes after SCI vary from person to person, depending on many factors: the level and completeness of the injury, neurologic recovery, associated complications (contractures, spasticity), amount of rehabilitation training, age, body size, weight, motivation, family support and financial status [5]. It is assumed that maximizing wheeled mobility and achieving overall independence are influenced by attitudinal factors such as self-efficacy, rather than by disability-related factors alone [6].

Perceived self-efficacy is defined as "beliefs in one's capabilities to organize and execute the courses of action required for producing given attainments" [7]. The stronger an individual's sense of efficacy in physical tasks, the more positive is this person's perceived psychological well-being [8]. Increased self-efficacy in WM may encourage wheelchair users with SCI to approach, persist, and persevere at WM related tasks that were previously avoided. In contrast, wheelchair users with low perceived self-efficacy in WM may become inactive when facing daily physical challenges; this may ultimately hinder their participation and quality of life.

Self-efficacy scales, such as The Generalized Perceived Self-Efficacy Scale (GSE) of Jerusalem & Schwarzer [9], which is presumably the most recognized self-efficacy scale, can be general and cover a broad-spectrum. Other self-efficacy scales can be domain specific, such as the Perceived Exercise Self-Efficacy Scale of Sallis et al. [10], which measured the confidence levels of individuals when participating in a physical activity under various conflicting situations. An example of a self-efficacy scale in the rehabilitation domain is The Self-efficacy Scale for Activities of Daily Living (SEADL), developed by Adnan et al. [11]. This scale is very detailed and assesses perceived self-efficacy in specific daily tasks (e.g. combing hair, eating with fork and spoon, etc.). Domain-specific self-efficacy scales assesses self-efficacy in relation to specific skills and are constructed at an intermediate level of difficulty and are better predictors of actual performance than are global tests [12].

Only a limited number of studies were found in the international literature, supporting perceived self-efficacy as a mediator of wheelchair mobile individuals' behaviour. As might be expected, athlete's sport self-efficacy likely transferred to feeling of efficacy for ADL. Hedrick reported that participation in tennis by wheelchair mobile adolescents increased their tennis self-efficacy [13]. Greenwood et al. [8], who investigated the psychological well-being of wheelchair tennis participants and of wheelchair non-tennis participants, found a significant correlation between perceptions of wheelchair mobility self-efficacy and perceptions of wheelchair tennis self-efficacy. In Adnan et al. study [11], athletes expressed much stronger self-efficacy, in particular for transferring from wheelchair to bed and seat, compared to non-athletes. Rushton et al. [14] recently assessed the content validity of a 62-item Wheelchair Use Confidence Scale (WheelCon-M). This comprehensive scale aims for clinicians as a method for identifying individuals who have low confidence with wheelchair use, and it is composed of six areas: negotiating the physical environment, activities performed using a manual wheelchair, knowledge and problem solving, advocacy, managing social situations and managing Emotions. This scale's validity and reliability measures are not yet published.

This study aims to test the reliability and validity of a recently developed SEWM scale [15]. A suggestion that was raised after reviewing the results of a pilot study (SCI, n = 47, wheelchair basketball players vs. recreational level participants, persons with paraplegia only), was to rephrase two of the items on the scale [15]. The Paralympic games in Beijing 2008 provided an opportunity to retest the validity and the reliability of the new version of the SEWM scale in a large international group of participants with tetraplegia and paraplegia. Complementary to the pilot study sample, the current study population consists of elite Paralympic athletes, forming an international sample of wheeled mobility experts. These athletes represent different types of sports, different level of SCI and different socio-cultural and linguistic backgrounds. If differences will be exposed in this group of athletes, it can provide further support for the scale sensitivity; therefore it was decided to compare perceived self-efficacy in WM in subgroups of these wheelchair-dependent elite athletes.

The main research questions were: (a) what is the internal consistency and the concurrent validity of the SEWM among a group of elite Paralympian wheelchair-dependent SCI? and (b) will perceived self-efficacy in WM among athletes who compete in dynamic wheelchair sports be significantly different from that of athletes competing in static or non-wheelchair sports?

Method

Based on a literature survey, experts' comments, the opinions of SCI wheelchair users representing different lesion levels, and the results and conclusions of the pilot study [15], ten items of the SEWM scale were recomposed (Appendix 1). The SEWM scale was originally developed in English and translated into French, Spanish, Dutch, Chinese and Hebrew by external experts in the field, who speak both source and target languages fluently, using a bi-directional (forward and backward) translation procedure [16]. The SEWM scale instructs respondents to rate how confident they are with regard to the performance of WM skills on a 4-point Liker scale (1 = not at all true, 2 = rarely true, 3 = moderately true, 4 = always true). Consisting of only 10 items, the SEWM is easy to administer and interpret which is a major strength of the tool. Marking 10 items is feasible even for individuals with limited hand function, as in the case of tetraplegia.

Design

This study was conducted in accordance with the guidelines of the Declaration of Helsinki, and was approved and supported by the International Paralympic Committee, Sport Science Committee (IPC SSC).

The participants who consented to participate in this study received questionnaires to fill out. The cluster of questionnaires included: a consent form, a personal information form, the Self-efficacy in Wheeled Mobility Scale [15] and the SCI Exercise Self-Efficacy Scale (ESES) [17]. The latter is a recently developed tool for measuring SCI exercise self-efficacy among community-dwelling adults who participate in structured exercise programs [17]. The ESES consists of ten items assessed using 4 point-Liker scale (minimum score 0, maximum score 40). Preliminary findings indicated that the ESES is a reliable instrument with high internal consistency (Cronbach's α = 0.92, n = 368) and satisfactory content and construct validity.

After completing the two self-efficacy scales, the participants were asked to answer the question: "How would you describe your level of wheeled mobility skills performance today?" Responses were provided by placing a vertical mark (| or X) on a 10 cm line, (0–10 WM VAS – visual analog scale [18], where 0 is equal to "poor" and 10 is equal to "excellent").

Data collection and sample characteristics

In order to increase response and minimize the interference in the athletes' schedule during the Paralympic games, several approaches were combined: during the first days of the games, the researchers met each team's managers (men and women's wheelchair basketball and wheelchair rugby teams), and briefly explained the study's aims and distributed the questionnaires. The researchers clarified that only athletes with SCI who are permanently wheelchair-dependent can participate in the study. Mobile telephone numbers of the managers were collected for sending reminders by text message (SMS). Besides contacting the teams' managers, the research team handed questionnaires to wheelchair basketball and wheelchair rugby players, off court between games. In individual sports (wheelchair tennis, archery, fencing etc.), the research team handed the questionnaires to SCI athletes while they were watching other matches and during their free time at the international zone in the Paralympic village. To ensure anonymity, completed questionnaires were returned by team managers or individual participants through a mailbox at the polyclinic in the athletes' Paralympic Village.

Sample

Approximately 250 questionnaires were passed to team managers and to individual athletes. Ninety-four questionnaires were returned, but only 79 were sufficiently completed, i.e. with the two self-efficacy scales fully completed.

Statistical procedures

The statistical analyses were performed using SPSS (version 15.0, SPSS Inc., Chicago, IL, USA).

SEWM analysis

Internal Consistency of the scale was determined by computing Cronbach's α and Split-half (Spearman Brown) correlation coefficients [19]. Concurrent Validity was obtained by correlating the SEWM with the 10-item ESES in the same populations. Regression analysis (predictive ability) of the SEWM and the ESES was performed. Finally, a correlation between the SEWM total score and a WM VAS scale, indicating their WM level at present, was analysed. Statistical significance was set at $p < 0.05$. As suggested by Colton [20], correlations ranging from 0.00 to 0.25 indicate little or no relationship; those from 0.25 to 0.50 suggest a fair degree of relationship; values of 0.50–0.75 are moderate to good; and values above 0.75 are considered good to excellent.

Athlete subgroups

Different categorizations for athlete subgroups were determined, following: (1) Gender (male/female); (2) Lesion characteristics: level (paraplegic vs. tetraplegic) and completeness (complete vs. incomplete) and (3) Type of sports: static wheelchair sports (e.g. archery, shooting) versus dynamic wheelchair sports (e.g. wheelchair tennis); wheelchair sports versus non-wheelchair sports (e.g. swimming, rowing); individual dynamic wheelchair sports (e.g. wheelchair tennis) versus team wheelchair sports (e.g. wheelchair basketball, wheelchair rugby). A Mann-Whitney test of the SEWM scores was used to investigate whether there were significant differences between pairs of above mentioned subgroups ($p < 0.05$).

Results

Participants

The study sample included 49 male and 30 female athletes from 18 countries and 14 sports disciplines. The sample included 64 persons with paraplegia and 15 with tetraplegia, whose ages ranged from 14 to 53 years (33 ± 8.18 years), Time since injury varied, ranging from 3 to 31 years (15.5 ± 6.63), and time participating in Paralympics sports ranged from 1 to 22 years (10 ± 5.5). Sample characteristics are presented in Table I.

Mean scores and SDs of the entire sample and the different subgroups, obtained using the two self-efficacy scales, are presented in Table II.

Reliability

Cronbach's α of the entire sample was 0.905 for the SEWM and 0.809 for the ESES. The internal consistency results of the SEWM items are presented in Table III. High internal consistency of the SEWM was confirmed in the Split-half method (EQ Length Spearman Brown r = 0.870).

Validity

Concurrent validity was determined by correlating the SEWM with the ESES total scores. There was a statistically significant correlation between the two scales ($r = 0.64$, $p < 0.05$). Concurrent validity between the SEWM total score and the "wheeled mobility at present" VAS score (total VAS mean score= 8.69 ± 1.5) was $r = 0.60$ ($p < 0.001$). Regression analysis (predictive ability – percentage of explained variance) conducted on the total score and the complete participant sample (SEWM vs. ESES) showed $R^2 = 0.409$ (Figure 1 and Table IV).

Athlete subgroups

There was a significant difference in perceived self-efficacy in WM between athletes with a paraplegia and tetraplegia (Table V). Also between athletes who participated in team and individual wheelchair sports versus those who participated in

Table I. Sample characteristics.

		n	Remarks
General	Total	79	Australia 2, Canada 5, Colombia 1, France 8, Great Britain 13, Germany 2, Greece 3, Hungary 1, Ireland 3, Israel 9, Italy 1, Morocco 1, New Zealand 2, Romania 1, Spain 3, Sweden 3, USA 20, Zimbabwe 1
	Male	49	
	Female	30	
Lesion level	Paraplegic	64	T1–T7: n = 17
			T8–T12: n = 32
			L1–L4: n = 12
			Missing data: n = 3
	Tetraplegic	15	C5–C8: n = 15
Completeness	Complete	46	Missing data n = 8
	Incomplete	25	
Paralympic sports category	Wheelchair dynamic team sports	33	Wheelchair rugby 6, Wheelchair basketball 27
	Wheelchair dynamic individual sports	15	Wheelchair tennis 8, Racing 5, Hand cycling 2
	Wheelchair static sports	15	Archery 6, Throwing 4, Fencing 1, Shooting 1, Table tennis 3
	Non- wheelchair sports	16	Equestrian 1,Rowing 2, Swimming 12, Sledge Hockey 1

Table II. Descriptive statistics: results of the entire sample and of the subgroups on the two self-efficacy scales.

Characteristic	SE Scale	n	Mean	SD	Min	Max
Total sample	ESES	79	35.87	3.68	25	40
	SEWM	78	36.65	4.22	24	40
Gender: Male	ESES	49	35.67	3.74	27	40
	SEWM	49	36.55	4.33	24	40
Female	ESES	30	36.20	3.62	25	40
	SEWM	29	36.83	4.12	25	40
Lesion: Tetra	ESES	15	35.47	2.50	32	40
	SEWM	15	33.80	4.65	24	40
Para	ESES	61	36.03	3.81	25	40
	SEWM	60	37.40	3.72	24	40
Sports type: Team wheelchair	ESES	32	36.69	3.09	29	40
	SEWM	31	37.9	3.23	27	40
Individual wheelchair sports	ESES	15	35.27	4.18	28	40
	SEWM	15	37.40	2.56	31	40
Individual static sports	ESES	15	35.47	3.48	27	40
	SEWM	15	36.33	3.42	28	40
Non-wheelchair sports	ESES	16	34.94	4.36	25	40
	SEWM	16	33.69	6.30	24	40

SD, standard deviation; ESES, SCI Exercise Self-Efficacy Scale; SEWM, Self-Efficacy in Wheeled Mobility Scale.

non-wheelchair sports a significant difference was seen. No significant differences were found among gender and complete/incomplete spinal cord injury or any of the other sports subgroup divisions.

Discussion

The main goal of this study was to test the statistical properties of the revised version of the recently developed SEWM scale [15]. This study confirmed the good reliability and construct and concurrent validity of the SWEM among a group of elite Paralympians at the Beijing games. The international sample of 79 participants from 18 different countries and 5 different continents strengthen its statistical results.

Findings confirmed the reliability of the SEWM by the high internal consistency of the scale's items. Compared to the pilot study [15], the internal consistency of the SEWM in this study was higher (In this study, Cronbach's α was 0.90; in the pilot study, Cronbach's α among the wheelchair basketball players was 0.81). These findings demonstrate the benefit of rephrasing items 8 and 9, and the necessity of conducting the current international study among a larger group of elite athletes.

Concurrent validity

First, based on the absolute mean values of both scales, athletes in the current study had high perceptions about their self-efficacy in wheeled mobility. SEWM mean scores were slightly higher than those of the ESES. The Paralympians who participated in this study, probably increased their WM abilities through their sports training and experiences, and therefore hold high beliefs about their WM competency. Similar to the pilot study results, regression analysis and correlation analyses values were higher for the SEWM compared to those of the ESES (Pilot study, SEWM vs. ESES: recreational $r = 0.61$; elite athlete $r = 0.73$). This can be explained by the fact that while both scales were developed specifically for the SCI population and both scales can be applied in the process of promoting an active life style for wheelchair users, the SEWM nevertheless is a more specific self-efficacy measure for WM.

Similar to the pilot study results, the moderate correlations indicate a reasonable fit of the SEWM with the ESES scale (also given the explained variance of 41%), and allows the conclusion that the measure is specific enough, and that it does not measure the same elements as the other scale.

Athlete subgroups

Type of sport

The two self-efficacy scales revealed higher WM self-efficacy perceptions among athletes who participate in dynamic (team and individual) wheelchair sports. The best way to increase self-efficacy, using enactive mastery, is through extensive practice [21]. The higher SEWM scores for these

Table III. Internal consistency (Cronbach's α) of SEWM items (n = 79),

	Scale mean if item deleted	Scale variance if item deleted	Corrected item-total correlation	Cronbach's α if item deleted
I can overcome barriers and challenges regarding wheeled mobility skills if I try hard enough	32.15	11.51	0.59	0.78
I can find means and ways to be independently mobile, using my wheelchair in everyday life setting	31.99	12.26	0.52	0.79
I can accomplish tasks that require independent wheelchair mobility such as ascending sidewalks and ramps.	32.19	11.54	0.52	0.79
When I am confronted with obstacles to wheelchair mobility, I can find solutions to overcome them	32.27	11.04	0.58	0.78
I can overcome mobility barriers and challenges even when I am tired	32.38	10.98	0.55	0.78
I can be independently mobile with my wheelchair even when I am depressed	32.44	10.91	0.47	0.79
I can be mobile with my wheelchair without the support of my family or friends	32.39	11.39	0.35	0.80
I can motivate myself to carry out a difficult and challenging wheeled mobility skill	32.32	10.68	0.47	0.79
I can learn new skills of wheeled mobility by myself	32.09	12.13	0.43	0.79
While using my wheelchair, I can usually handle whatever comes my way	32.65	9.59	0.58	0.78

SEWM, Self-Efficacy in Wheeled Mobility Scale.

dynamic sports athletes (mainly wheelchair basketball and wheelchair rugby players) may be explained by more WM experiences and competences gained through practice, compared to those who participate in non-wheelchair sports or in static sports. Therefore, dynamic sports athletes were more confident about their WM capabilities. However, it is impossible to determine whether the athletes who joined dynamic wheelchair sports initially felt more competent in WM than did their static-sports peers and therefore chose this sports type, or if they joined dynamic sports and then became highly competent in WM, as a result of their practice. According to Bandura's theory [7], it might be an example for bi-directional influences. The direction of an influence is not mutually exclusive; it can go both ways. Thus, encouraging wheelchair users to join dynamic wheelchair sports, even for a short period of time, in order to improve WM performance is a logical conclusion based on this study's findings.

Similar to the current study, the pilot study results showed significantly higher self-efficacy perceptions for the more active group [15]. However, the comparison was made between two quite different characteristic wheelchair user groups (wheelchair basketball players vs. recreational level participants). In the current study, reliability and validity scores for the SWEM among the rather homogenous group of elite Paralympians, seems to further support and strengthen the psychometric quality of the SEWM scale. Greenwood et al. [8], found a significant correlation between perceptions of wheelchair mobility self-efficacy and perceptions of wheelchair tennis self-efficacy. However, this study lacks information regarding both the scale items and the statistical procedures undertaken to establish the validity and reliability of the tool.

Lesion level comparison

Since the pilot study sample did not include participants with tetraplegia, the current study, revealing significant differences between athletes with paraplegia and (the rather small group of) athletes with tetraplegia in terms of perceived self-efficacy in wheeled mobility, provides a valuable feedback to the researchers for future studies focusing on wheeled mobility related aspects. These significant differences support the results of other studies which focus on different variables related to functioning after SCI. Yet, the literature provides little information about the relation between lesion level on the one hand and wheelchair mobility on the other hand. In Kilkens et al. "Wheelchair circuit" test [22], persons with paraplegia performed better than persons with tetraplegia. Also Janssen et al. [23], who studied physical strain during the performance of wheelchair tasks in persons with long-standing SCI has found that persons with tetraplegia experienced significantly higher levels of strain during task performance, than persons with paraplegia. In a recently published literature review of WM assessment tools [24], it was stated that previous tests failed to differentiate between levels of performance. Many tools exist for measuring WM in generalized wheelchair user populations. As a result, "ceiling or floor effects were the consequence of lack of precision and the ability of an instrument to detect meaningful changes in level of performance at the upper or lower ends of the scale" [24]. The current study results suggest that also in the case of a psychological variable as self-efficacy, wheelchair skills might be differently viewed by persons with tetraplegia and paraplegia. This may indicate that while testing actual WM performance, different levels of tasks difficulty may be required for participants with tetraplegia or paraplegia in order to enhance test responsiveness in these two subgroups. Middleton et al. [25] tested the psychometric properties of the Moorong Self-Efficacy Scale (MSES).

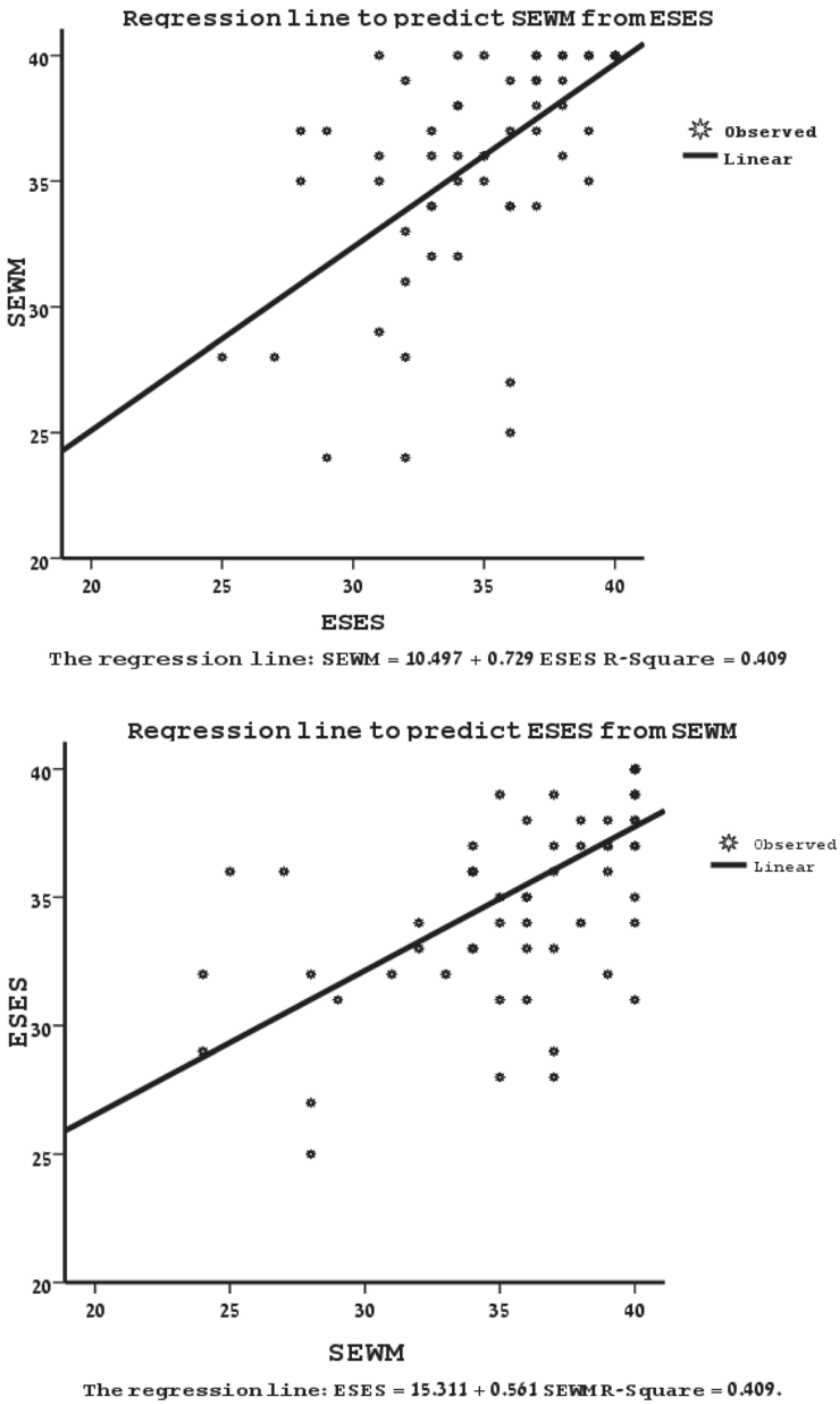

Figure 1. Predictive ability (percentage of explained variation) SEWM versus ESES. ESES, SCI Exercise Self-Efficacy Scale; SEWM, Self-Efficacy in Wheeled Mobility Scale.

The MSES is a 16-item scale rating confidence in performing everyday activities on a 7-point Likert scale. This new scale was designed for individuals with SCI and samples items across a wide range of relevant life domains, i.e., functional, social, leisure, and vocational activities. However, this scale is lacking any WM specific item. Unlike the current study result, in Middleton's study, there were no significant differences between paraplegics and tetraplegics in perceived self-efficacy.

Table IV. The analyses of variance and coefficient values for the regression analyses.

ANOVA[a]					
	Sum of Squares	df	Mean Square	F	Sig.
Regression	561.862	1	561.862	52.602	<0.000001[b]
Residual	811.792	76	10.681		
Total	1373.654	77			

Coefficients[c]					
Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	β	B	SE
(Constant)	10.497	3.625		2.895	0.005
ESES - total score	0.729	0.101	0.640	7.253	<0.000001

ANOVA[d]					
	Sum of Squares	df	Mean Square	F	Sig.
Regression	432.226	1	432.226	52.602	<0.00001[e]
Residual	624.492	76	8.217		
Total	1056.718	77			

Coefficients[f]					
Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	SE	β	B	SE
(Constant)	15.311	2.853		5.366	0.000001
SEWM – total score	0.561	0.077	0.640	7.253	<0.000001

[a]Dependent variable: SEWM - total score.
[b]Predictors: (Constant), ESES - total score.
[c]Dependent variable: SEWM - total score.
[d]Dependent variable: ESES - total score.
[e]Predictors: (constant), SEWM - total score.
[f]Dependent variable: ESES - total score.
Unstandardized coefficients (B) = the regression coefficients
ESES, SCI Exercise Self-Efficacy Scale; SEWM, Self-Efficacy in Wheeled Mobility Scale.

Table V. A comparison between athletes' subgroups.

Characteristic	SEWM total scoreMann-Whitney U	Asymp. Sig. (two-tailed)
Gender comparison (n = 79): Male vs. Female	682.5	0.76
Lesion comparison (n = 71): Tetraplegia vs. Paraplegia	216.5	0.001
Type of sport comparison (n = 64): Team and individual wheelchair sports vs. non-wheelchair sports	236	0.03
Type of sport comparison (n = 63): Team and individual wheelchair sports vs. static sports	256	0.12
Type of sport comparison (n = 48): Team wheelchair sports vs. individual wheelchair sports	188.5	0.28

SEWM, Self-Efficacy in Wheeled Mobility Scale.

SCI Motor completeness

No significant differences were found for motor completeness of the lesion, neither in the pilot study nor at the present study results. There are two possible explanations for this result. First, all participants were wheelchair-dependent. This implies that, in participants with incomplete lesions, the spinal cord was nevertheless severely damaged. The distinction in functioning between persons with motor complete and persons with motor incomplete lesions is therefore less evident. Secondly, it could be that the completeness of the lesion is not related to perceived self-efficacy in WM, as reported in other perceived self efficacy studies involving individuals with disabilities [25,26].

Gender differences

Males are often reported to have higher scores on self-efficacy and related constructs [26]. Unexpectedly, and perhaps partially because the sample size was somewhat unbalanced (Females: n = 30; Males: n = 49), there were no gender differences in perceived self-efficacy in WM in the current study. This may be due to the fact that the females participated in this study were top Paralympian athletes, with high WM capabilities, resulting in a high-perceived self-efficacy in WM and thereby to a low gender difference.

Study limitations

The current sample of a convenience sample of n = 79, included top athletes with SCI only and cannot be representative of the entire SCI athlete population or the general SCI population. The low return rate of questionnaires (less than 33%) should also be mentioned. It could be explained in several ways: during the Paralympic games, athletes are focusing on the most important sports event of their lives. It is logical that research and questionnaires would not be their highest priorities during these days.

The SEWM scale has been developed in a conceptual overlap with other tools, and it is unclear yet to what extent the SEWM correlates with measures of actual WM performance. The SEWM scale needs to be further tested in a study on a more comprehensive assessment of WM performance. Additional studies are needed to determine the scale's usefulness and sensitivity for detecting change in perceived self-efficacy as a result of WM interventions for people with SCI during and after rehabilitation.

Conclusions and future applications

SEWM is suggested to be a reliable instrument with a high internal consistency and good concurrent validity for wheelchair-dependent athletes with SCI.

Comparing and combining the outcomes of the current study with the pilot study results [15], offers a more accurate reflection of WM self-efficacy perceptions among SCI population. It is expected that this scale may find future clinical applications in measuring self-efficacy perceptions in wheelchair skills performance of individuals with SCI, may be a predictor for actual WM performance, and may be used comprehensibly to actual performance-based WM evaluation.

To support the preliminary statistical properties of the SEWM towards identifying more definitive psychometric characteristics, an extended study following a test retest analysis would be helpful to ascertain the stability of scores. In addition, testing the SEWM on a sedentary population of SCI, and on wheelchair users with different impairments, is highly recommended.

In future studies, it may be useful to reflect on the position of self-efficacy on the outcomes of WM intervention and to test whether self-efficacy is a mediator or moderator for WM skill performance [27]; if perceived self-efficacy in WM is a mediator, it will be responsible for all or part of the effects of a treatment on the outcome (i.e. those with initial higher self-efficacy in wheeled mobility perceptions will perform better). If perceived self-efficacy in WM is a mediator, self-efficacy in WM perceptions will get changed during the intervention, be associated with the treatment, and will have an effect on the outcome.

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References

1. International Classification of Functioning, disability and health. Geneva: World Health Organization; 2001
2. Post MW, van Asbeck FW, van Dijk AJ, Schrijvers AJ. Services for spinal cord injured: availability and satisfaction. Spinal Cord 1997;35:109–115.
3. Kilkens OJ, Post MW, Dallmeijer AJ, van Asbeck FW, van der Woude LH. Relationship between manual wheelchair skill performance and participation of persons with spinal cord injuries 1 year after discharge from inpatient rehabilitation. J Rehabil Res Dev 2005;42:65–73.
4. Somers M. Spinal cord injury, functional rehabilitation. Connecticut: Appleton & Lange; 1992.
5. Jongjit J, Sutharom W, Komsopapong L, Numpechitra N, Songjakkaew P. Functional independence and rehabilitation outcome in traumatic spinal cord injury. Southeast Asian J Trop Med Pub health 2004;35:980–985
6. Nosek MA, Fuhrer MJ, Potter C. Life satisfaction of people with physical disabilities: relationship to personal assistance, disability status, and handicap. Rehabil Psychol 1995;40:191–202.
7. Bandura A. Self-efficacy: The exercise of control. New York, NY: W.H. Freeman; 1997.
8. Greenwood CM, Dzewaltowski DA, French R. Self-efficacy and psychological well-being of wheelchair tennis participants and wheelchair nontennis participants. APAQ 1990;7: 12–21.
9. Jerusalem M, Schwarzer R. Self-efficacy as a resource factor in stress appraisal processes. In: Schwarzer R, editor. Self-efficacy: Thought control of action. Washington, DC: Hemisphere; 1992. pp 195–213.
10. Sallis JF, Pinski RB, Grossman RM, Patterson TL, Nader PR. The development of self-efficacy scales for healthrelated diet and exercise behaviours. Health Educ Res 1988;3:283–292.
11. Adnan Y, McKenzie A, Miyahara M. Self-Efficacy for Quad Rugby Skills and Activities of Daily Living. APAQ 2001;18:90–101.
12. Bandura A. Social foundations of thought and action: A social cognitive theory. Englewood Cliffs, NJ: Prentice-Hall; 1986.
13. Hedrick BN. The effect of wheelchair tennis participation and mainstreaming upon the perceptions of competence of physically disabled adolescents. Therapeutic Recreation Journal 1985;19: 34–46.
14. Rushton PW, Miller WC, Lee Kirby R, Eng JJ, Yip J. Development and content validation of the Wheelchair Use Confidence Scale: a mixed-methods study. Disabil Rehabil Assist Technol 2011;6:57–66.
15. Fliess-Douer O, van der Woude LH, Vanlandewijck YC. Development of a new scale for perceived self-efficacy in manual wheeled mobility: a pilot study. J Rehabil Med 2011;43:602–608.
16. Hambleton RK. Forward and backward translation of tests. Adapting educational and psychological tests for cross-cultural assessment. NJ: Lawrence Erlbaum Associates, Inc.; 2005.
17. Kroll T, Kehn M, Ho PS, Groah S. The SCI Exercise Self-Efficacy Scale (ESES): development and psychometric properties. Int J Behav Nutr Phys Act 2007;4:34.
18. Price DD, McGrath PA, Rafii A, Buckingham B. The validation of visual analogue scales as ratio scale measures for chronic and experimental pain. Pain 1983;17:45–56.
19. Portney LG, Watkins MP. Foundations of clinical research – applications to practice. Connecticut: Appleton & Lange; 1993.
20. Colton T. Statistic in medicine. Boston, MA: Little, Brown and Company; 1974.
21. Smith SL, West RL. The application of self-efficacy principles to audiologic rehabilitation: a tutorial. Am J Audiol 2006;15:46–56.
22. Kilkens OJ, Dallmeijer AJ, De Witte LP, Van Der Woude LH, Post MW. The Wheelchair Circuit: Construct validity and responsiveness of a test to assess manual wheelchair mobility in persons with spinal cord injury. Arch Phys Med Rehabil 2004;85:424–431.
23. Janssen TW, van Oers CA, Veeger HE, Hollander AP, van der Woude LH, Rozendal RH. Relationship between physical strain during standardised ADL tasks and physical capacity in men with spinal cord injuries. Paraplegia 1994;32:844–859.
24. Fliess-Douer O, Vanlandewijck YC, Lubel Manor G, Van Der Woude LH. A systematic review of wheelchair skills tests for manual wheelchair users with a spinal cord injury: towards a standardized outcome measure. Clin Rehabil 2010;24:867–886.
25. Middleton JW, Tate RL, Geraghty TJ. Self-Efficacy and Spinal Cord Injury: Psychometric Properties of a New Scale. Rehabil Psychol 2003;48:281–288.
26. Martin JJ. Multidimensional self-efficacy and affect in wheelchair basketball players. Adapt Phys Activ Q 2008;25:275–288.
27. Turner JA, Holtzman S, Mancl L. Mediators, moderators, and predictors of therapeutic change in cognitive-behavioral therapy for chronic pain. Pain 2007;127:276–286.

Appendix 1: Self-Efficacy in Wheeled Mobility Scale (SEWM)

Name: ______________________ Team/Club: _______________________

Please tell us how confident you are with regard to carrying out the wheeled mobility skills below (Please check only one box for each question).

I am confident that:	Always true	Moderately true	Rarely true	Not at all true
I can overcome barriers and challenges regarding wheeled mobility skills if I try hard enough	☐	☐	☐	☐
I can find means and ways to be independently mobile, using my wheelchair in everyday life setting	☐	☐	☐	☐
I can accomplish tasks that require independent wheelchair mobility such as ascending sidewalks and ramps.	☐	☐	☐	☐
When I am confronted with obstacles to wheelchair mobility, I can find solutions to overcome them	☐	☐	☐	☐
I can overcome mobility barriers and challenges even when I am tired	☐	☐	☐	☐
I can be independently mobile with my wheelchair even when I am depressed	☐	☐	☐	☐
I can be mobile with my wheelchair without the support of my family or friends	☐	☐	☐	☐
I can motivate myself to carry out a difficult and challenging wheeled mobility skill	☐	☐	☐	☐
I can learn new skills of wheeled mobility by myself	☐	☐	☐	☐
While using my wheelchair, I can usually handle whatever comes my way	☐	☐	☐	☐